

WHAT IS CLAIMED IS:

1. A resin-molded article with a spring structure comprising a three-dimensional structure including voids at a predetermined bulk density, the three-dimensional structure being obtained by contacting, entwining, and gathering adjacent ones of random loops or curls of continuous, solid and/or hollow filaments made from a thermoplastic resin and/or a thermoplastic elastomer in such a manner as to allow the resulting structure to have a layered structure in which oppositely lengthwise disposed superficial layers have a bulk density of 0.2 to 0.5 g/cm³, and a core layer sandwiched by the superficial layers has a bulk density of 0.01 to 0.15 g/cm³.

2. A resin-molded article with a spring structure as in Claim 1 in which each superficial layer has a bulk density of 0.3 to 0.4 g/cm³, and void ratio of 44 to 77%, and the core layer has a bulk density of 0.01 to 0.15 g/cm³ and void ratio of 83 to 99%.

3. A resin-molded article with a spring structure as in Claim 2 in which each superficial layer has a void ratio of 56 to 67%, and the core layer has a bulk density of 0.03 to 0.05 g/cm³ and void ratio of 94 to 97%.

4. A resin-molded article with a spring structure as in Claim 1 in which a mixing ratio of solid filaments to hollow filaments is preferably 0 to 50 : 50 to 100.

5. A resin-molded article with a spring structure as in Claim 1 in which said hollow filaments are placed at a core, and surrounded by solid ones which are placed in superficial layers.

6. A method for producing superficial layers of a resin-molded article with a spring structure comprising a three-dimensional structure including voids at a predetermined bulk density, comprising, when obtaining the three-dimensional structure by extruding a melt of a thermoplastic resin and/or a thermoplastic elastomer into melted continuous filaments, and causing adjacent filaments to contact each other, entwine and gather to form random loops and curls, the steps of:

exposing the opposite lengthwise surfaces of a three-dimensional structure

comprising melted filaments extruded from a die to the uniformly flowing currents of cooling water such that the lengthwise surfaces of the three-dimensional structure are agitated by the currents at an extended distance, which cause adjacent continuous filaments to contact each other, and entwine to form loops and curls; and

producing a three-dimensional structure having a layered structure in which superficial layers comprising loops and curls have a high bulk density and a core layer sandwiched by the superficial layers has a low bulk density.

7. A system for producing superficial layers of a resin-molded article with a spring structure comprising a three-dimensional structure including voids at a predetermined bulk density, the three-dimensional structure being obtained by extruding a melt of a thermoplastic resin and/or a thermoplastic elastomer into melted continuous solid and/or hollow filaments, and causing adjacent filaments to contact each other, entwine and gather to form random loops and curls, comprising a superficial layer-forming unit which includes:

rectangular shoots each having an inclined surface placed opposite to each other with a gap in between to receive the filaments in such a manner as to shift the gap being narrower in lengthwise of extruding the filaments passing through the gap;

water-permeating sheets which cover the top surfaces of the respective shoots; and cooling water supply portions each of which flows water between a water-permeating sheet and the top surface of a shoot,

wherein some part of the water flow penetrates the water-permeating sheet to appear on its top surface to form there an overlying water current uniformly spreading lengthwise, while the other part of the water flow forms an underlying water current, and peripheral filaments constituting a lengthwise surface of a three-dimensional structure which will constitute a superficial layer of the three-dimensional structure is exposed to and agitated by the flow end of an overlying current such that adjacent filaments are caused to contact each other, entwine and gather to form loops and curls.

8. A system for producing superficial layers of a resin-molded article with a

spring structure as Claim 7 in which the water-permeating sheet is made of a material such as cloth which allows water to permeate, and has a higher frictional coefficient than does stainless steel or a fluorine resin.

9. A system for producing superficial layers of a resin-molded article with a spring structure as Claim 7 in which said each shoot consists of a stainless steel plate whose working surface is coated with a fluorine resin.,